



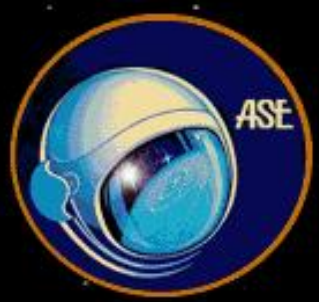
# Association of Space Explorers

**National Defense University  
Toward a Theory of Spacepower  
26 April 2007**

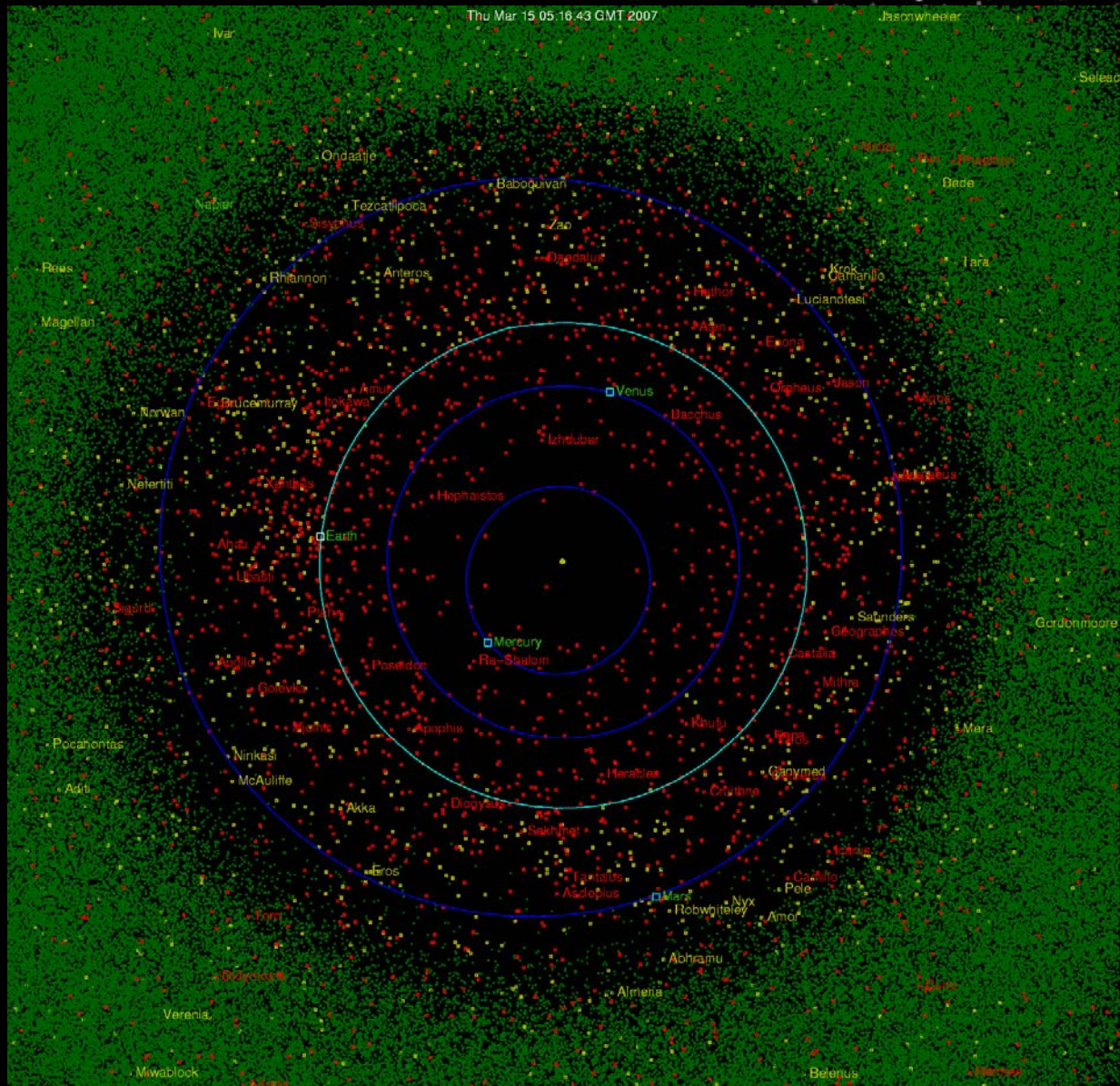
## **Space and the Commonwealth of Mankind The NEO Challenge**

**Rusty Schweickart  
Chairman, NEO Committee,  
Association of Space Explorers;  
Chairman, B612 Foundation**

Report Documentation Page				Form Approved OMB No. 0704-0188	
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1. REPORT DATE <b>28 APR 2007</b>		2. REPORT TYPE		3. DATES COVERED <b>00-00-2007 to 00-00-2007</b>	
4. TITLE AND SUBTITLE <b>Space and the Commonwealth of Mankind The NEO Challenge</b>				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) <b>National Defense University, Institute for National Strategic Studies, 300 5th Avenue SW, Washington, DC, 20319</b>				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT <b>Approved for public release; distribution unlimited</b>					
13. SUPPLEMENTARY NOTES <b>Towards a Theory of Spacepower. 25-26 Apr 2007, Fort Lesley J. McNair, Washington, DC</b>					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT <b>Same as Report (SAR)</b>	18. NUMBER OF PAGES <b>21</b>	19a. NAME OF RESPONSIBLE PERSON
a. REPORT <b>unclassified</b>	b. ABSTRACT <b>unclassified</b>	c. THIS PAGE <b>unclassified</b>			



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2007



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## The Bottom Lines

**1) Decisions re a NEO threat will likely have to be made within a decade**

- Rapidly changing (knowledge) environment.

**2) NEO challenge is intrinsically international**

- Specific impact point unknown at decision time
- Deflection = shift of risk between nations

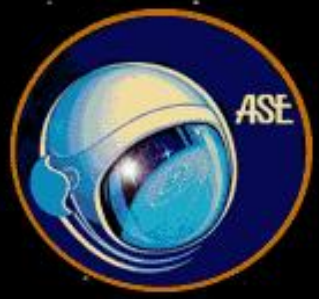
**3) Deflection options; non-nuclear and nuclear**

- The issue of precision (NASA missed it)
- Nuclear option needed only for near term, low probability event

**4) World community must make key decisions**

- ASE-NEO Workshops; draft UN/COPUOS instrument





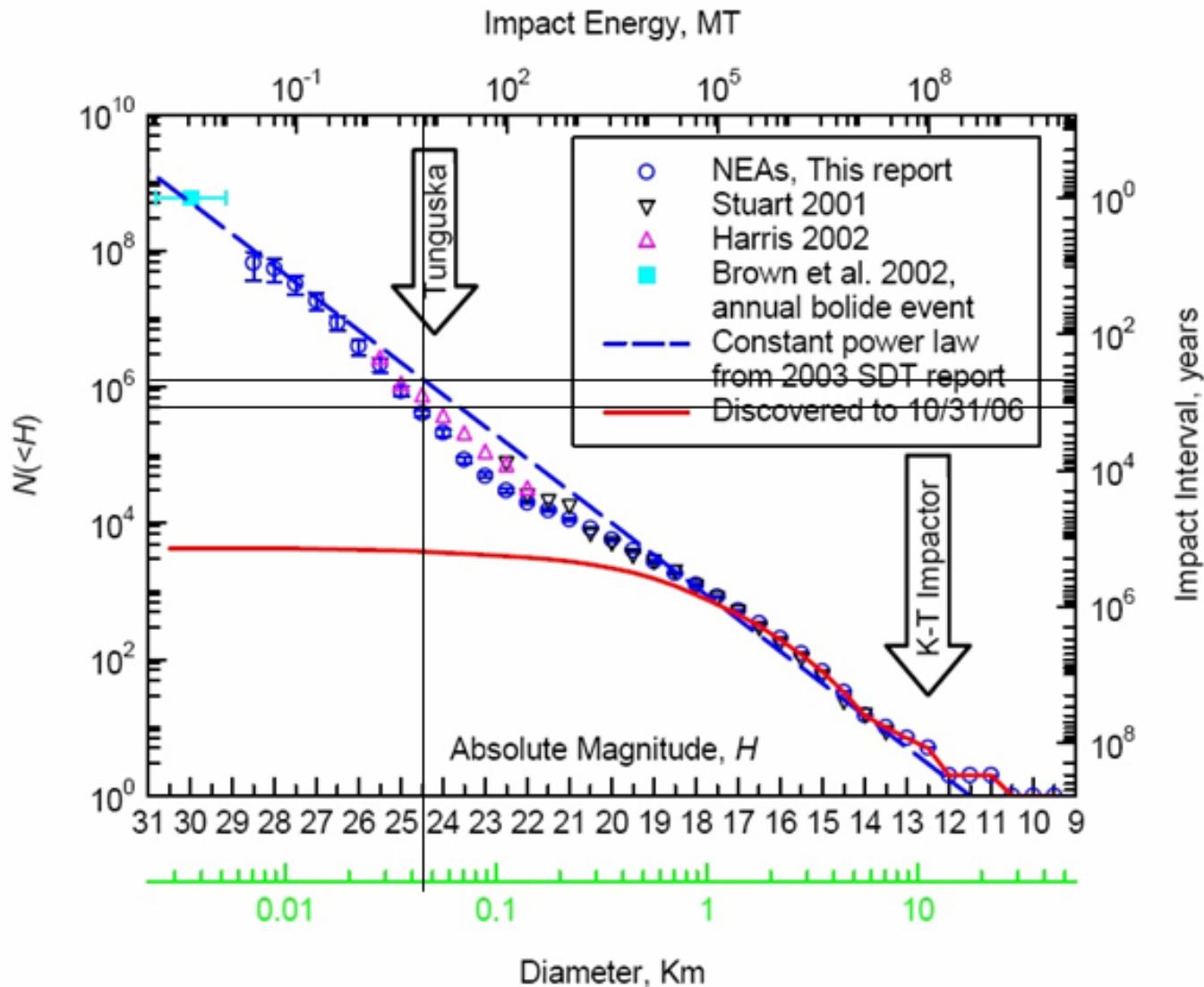
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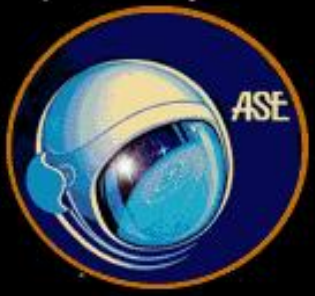
## The Three Components of Protection of the Earth from NEO Impacts

- ✓ Early Warning
- ✓ Proven Deflection Capability
- ✓ International Decision-making Protocol



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## Early Warning

### Spaceguard 1 & 2

(Comparable Numbers)

2007 2019

Target Population

1,000 25,000

71% completed

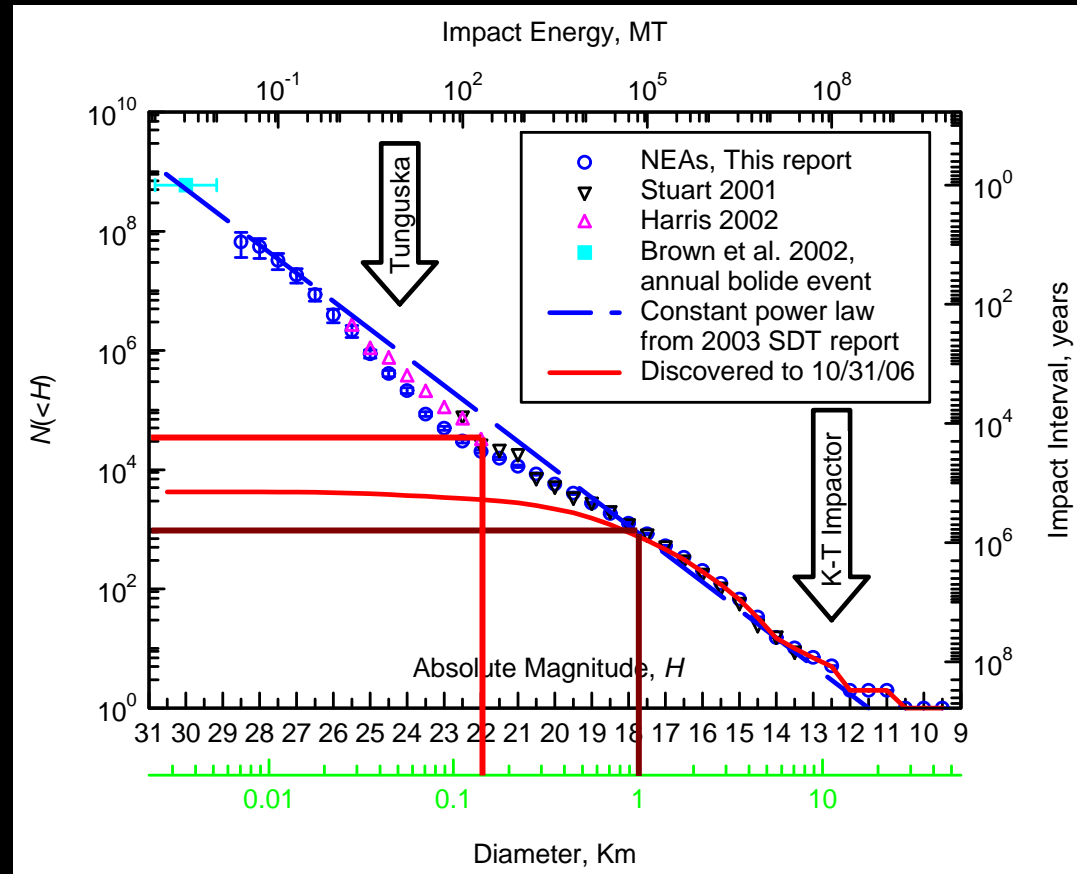
708 18,000

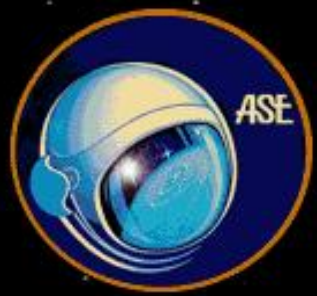
Total Discovered

4,640 116,000

Potential Impactors

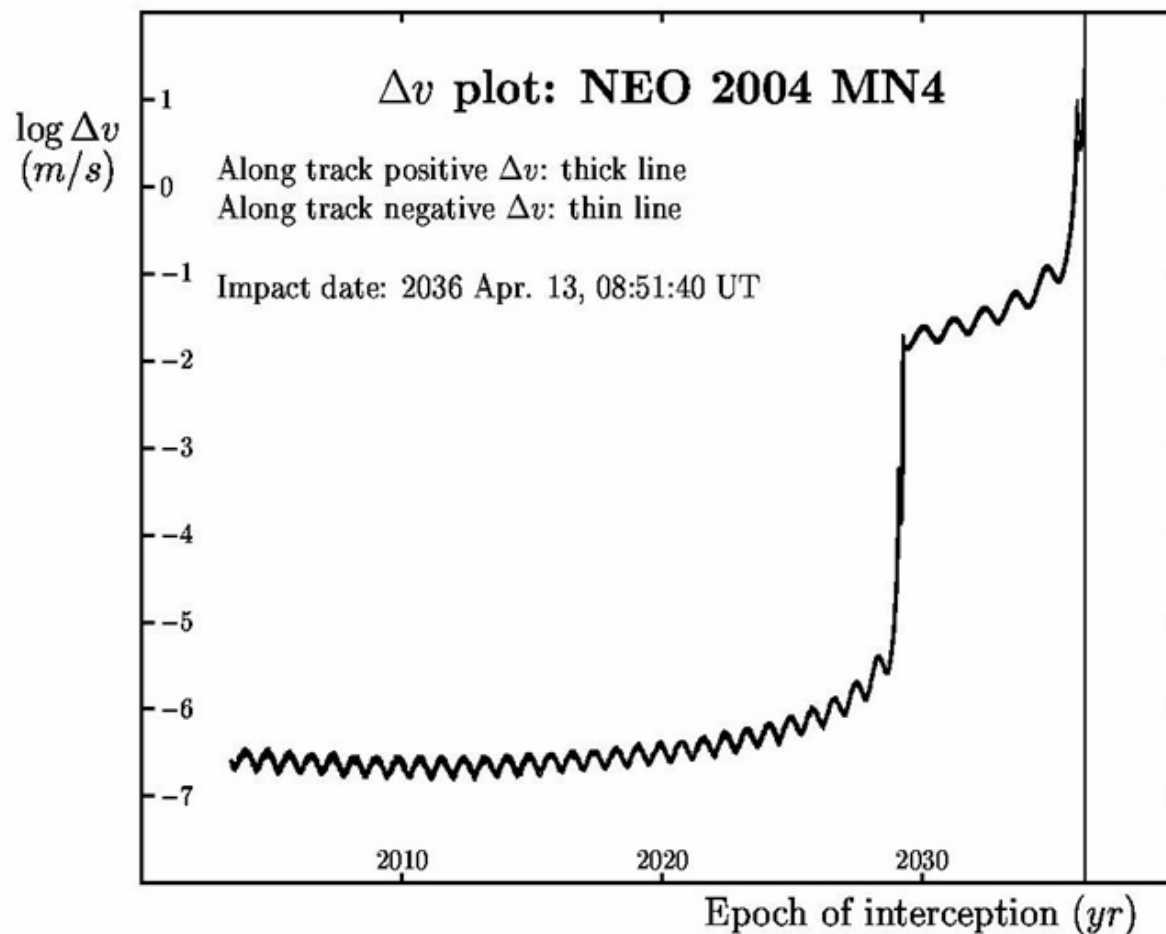
137 3,400





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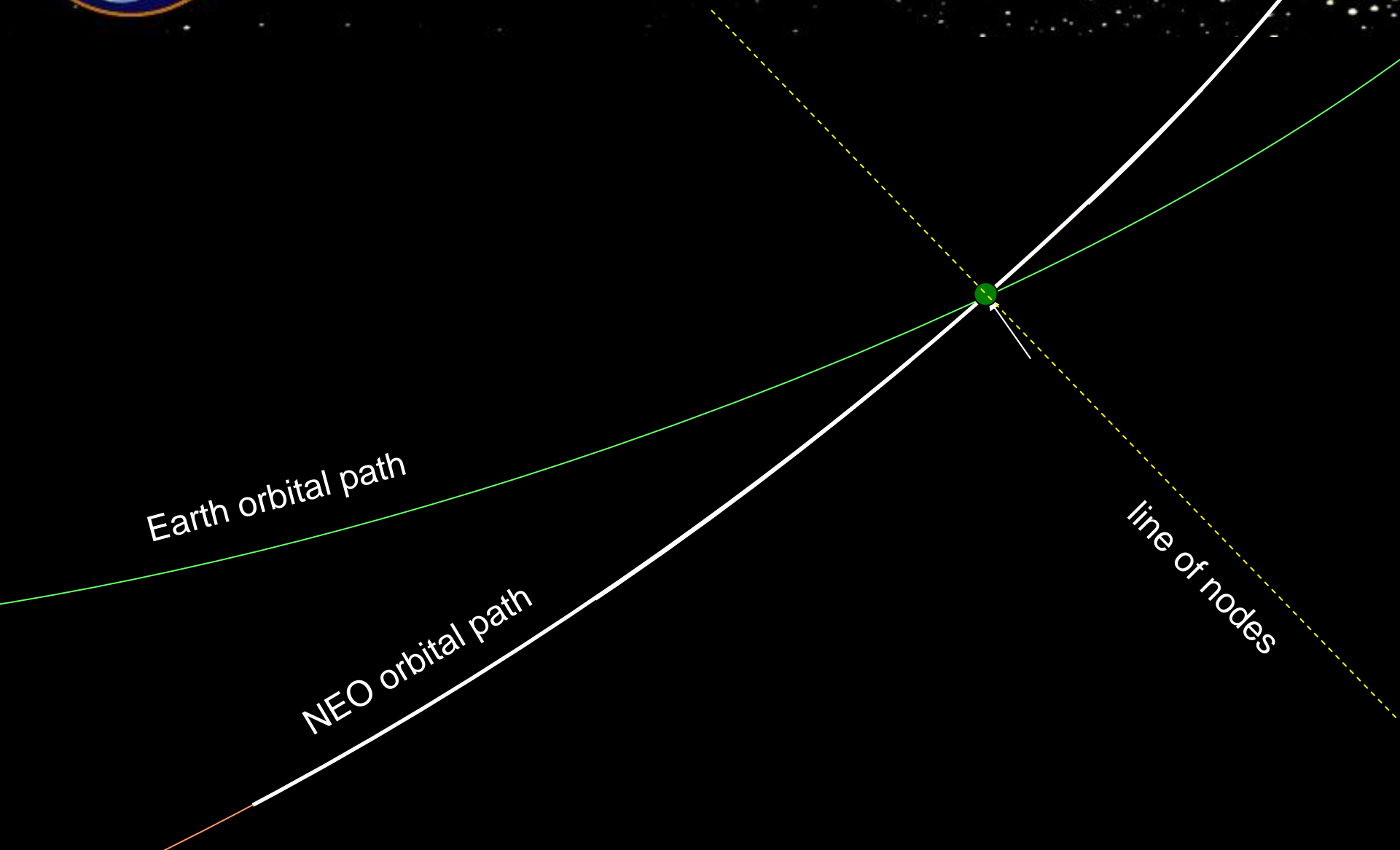
## Decision Time

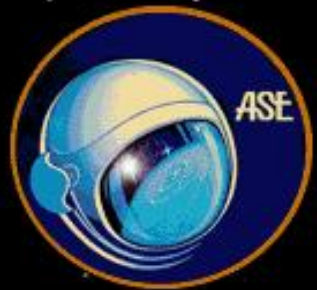




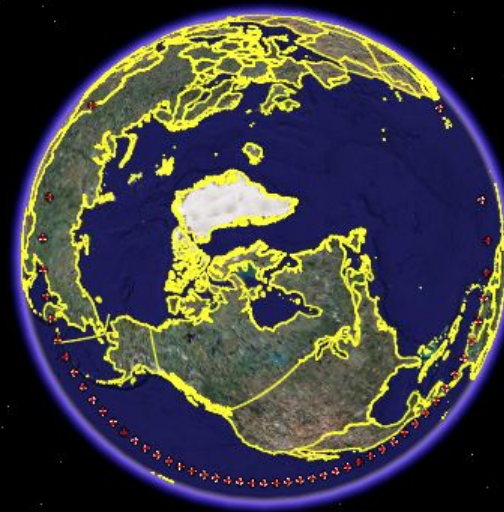
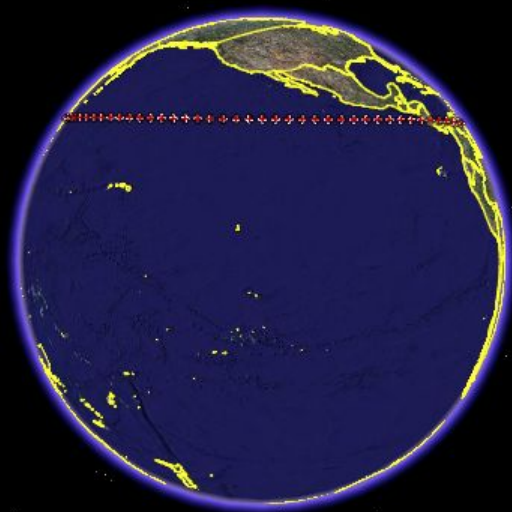


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**2007 - Path of Risk for Apophis**

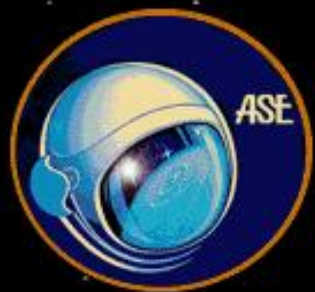




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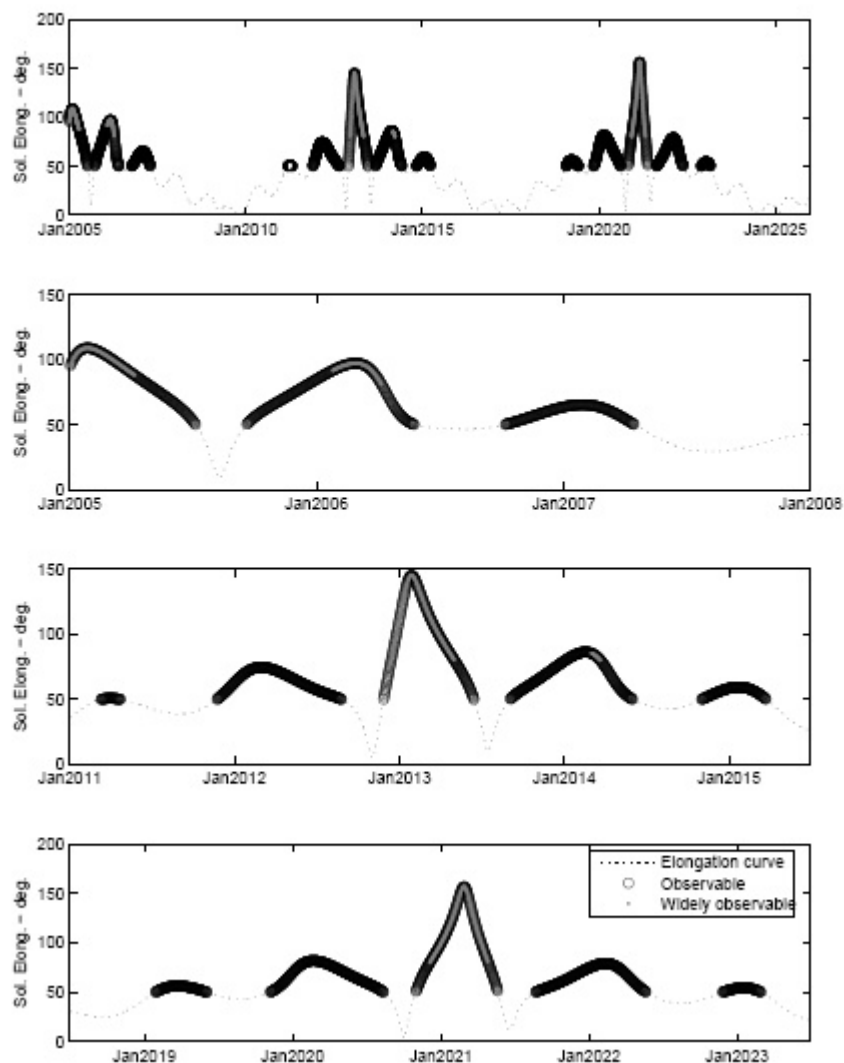
**2020 - Paths of Risk for NEOs of  
Concern**



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## Episodic Tracking

*Potential Impact Detection*







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## Current Deflection Capability

### Kinetic Impact

Pushes the asteroid via direct impact



### Gravity Tractor

Pulls the asteroid using mutual gravity as a tow-rope



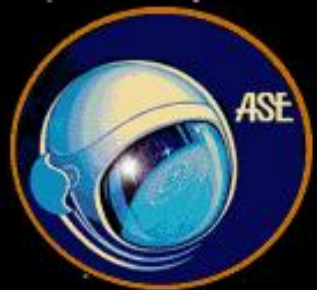


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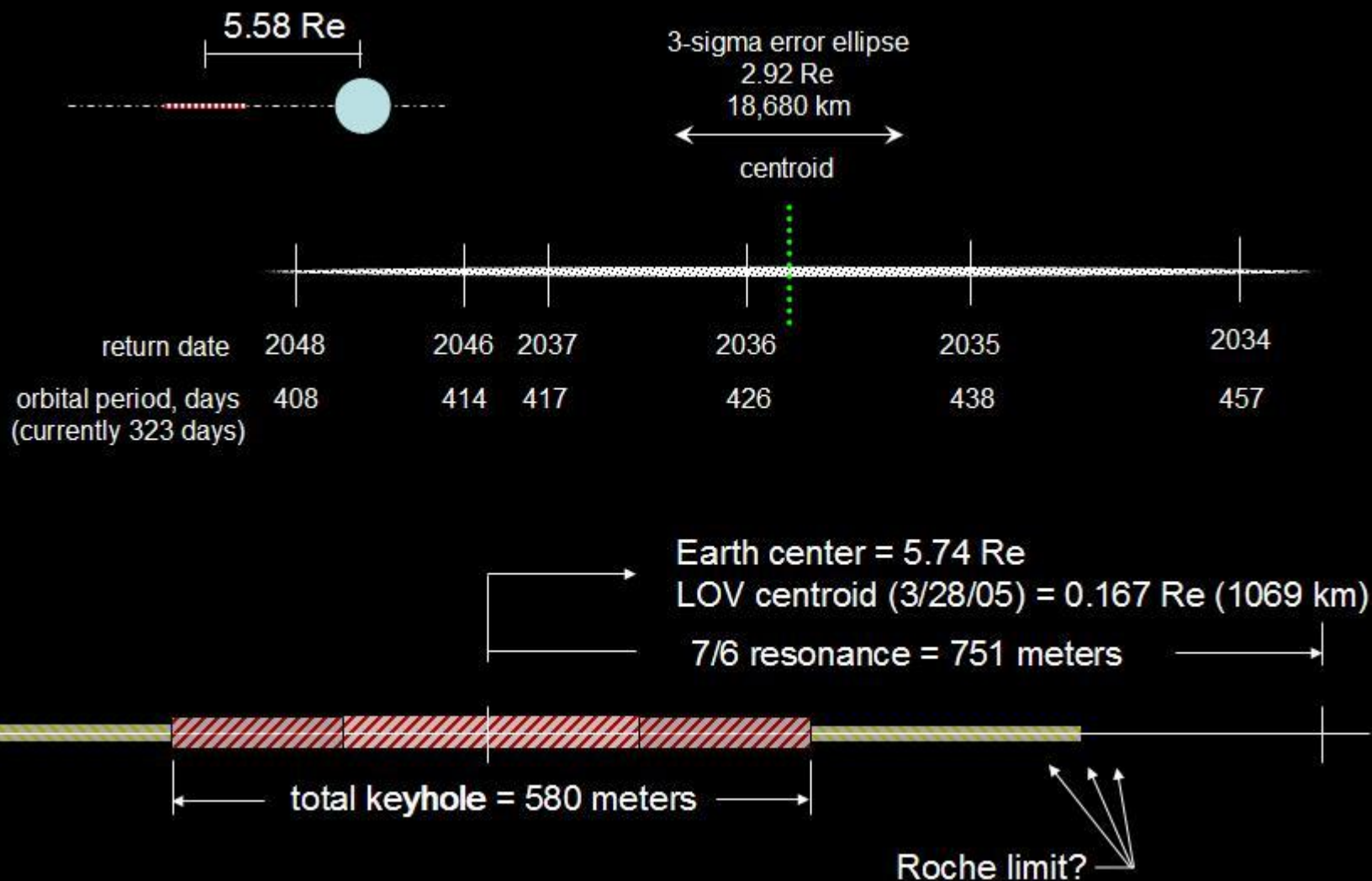
## Nuclear Explosion

Explodes surface off NEO  
to create impulsive push





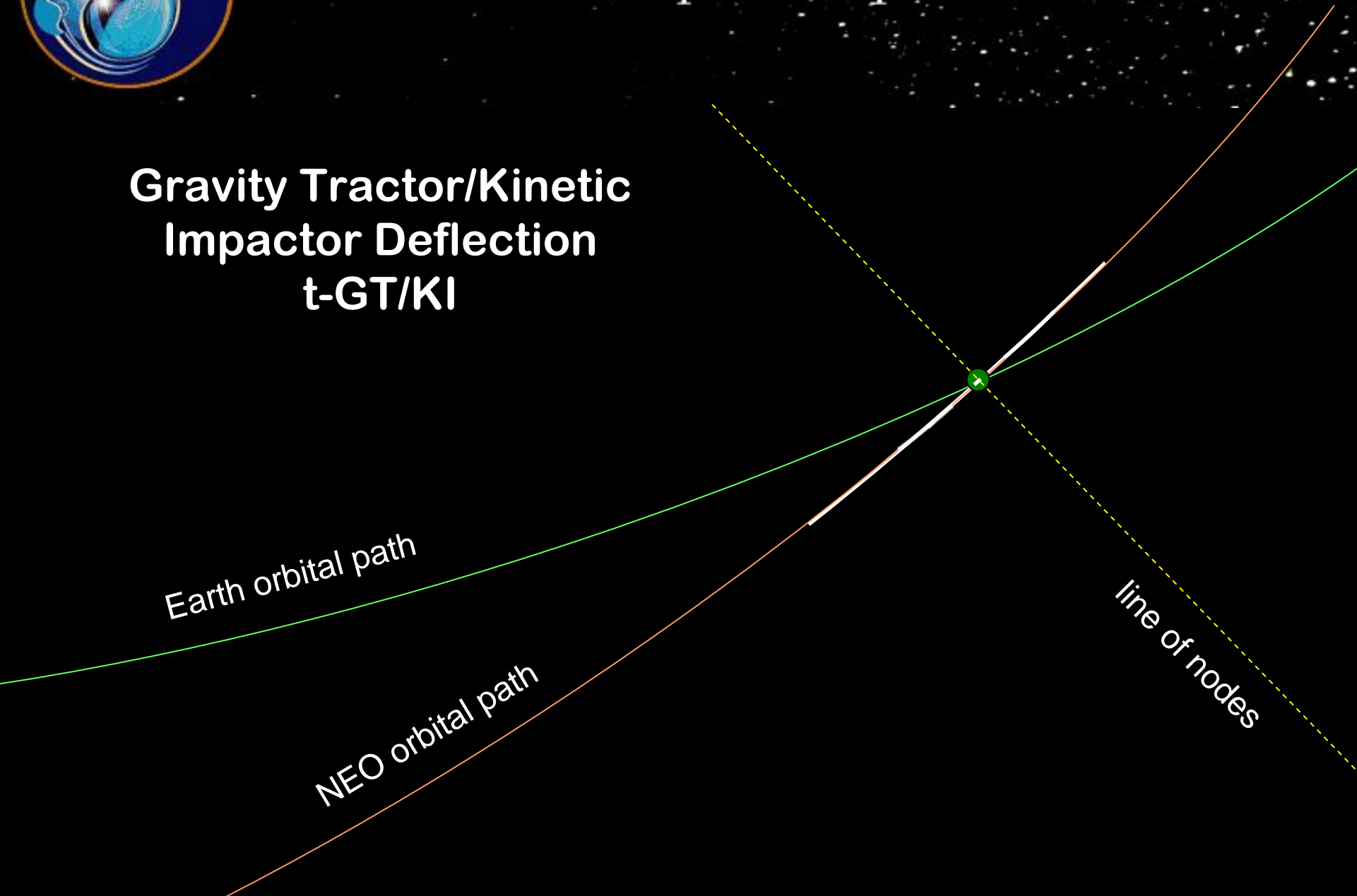
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## Gravity Tractor/Kinetic Impactor Deflection t-GT/KI

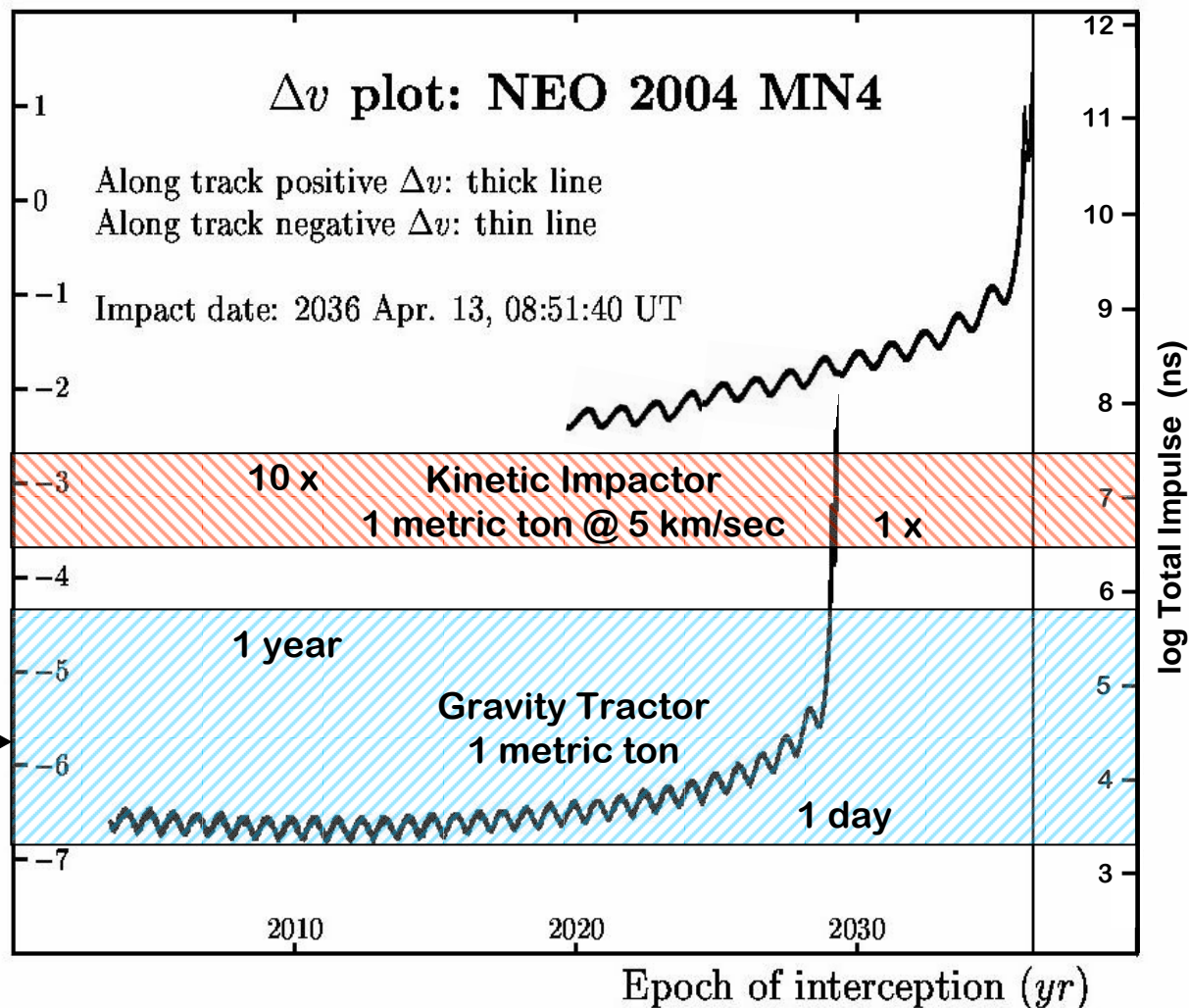






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## Deflection Time

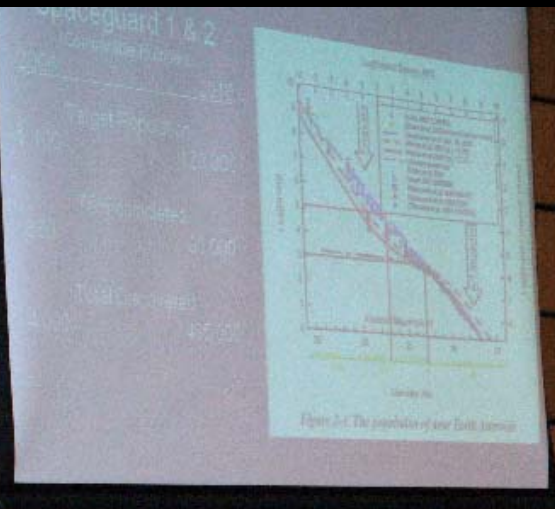


12.2 days  
@ 0.04 N  
= 42,160 NS





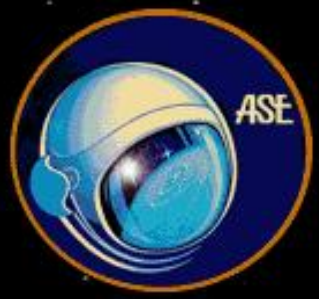
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**The ASE-NEO  
Committee  
addressing the UN  
Committee on  
Peaceful Uses of  
Outer Space on the  
NEO impact threat**

**February, 2006**





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**The ASE takes the position that...**

- 1. The United Nations is the appropriate forum for decision making**
- 2. An adopted treaty or protocol specifying the decision process should be in place as soon as possible**
- 3. The information on NEOs provided by member states must support this negotiated decision process**



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## International Decision-Making

### ASE Next Steps..

**Bring together a group of world diplomatic and legal experts in a series of 4 workshops to identify, develop, and ponder the many issues associated with a pending NEO impact. (First workshop scheduled for 9-12 May, 2007, Strasbourg, France)**

**Generate, as a workshop product, a draft United Nations Treaty (Protocol, Convention, ...) on NEO Deflection.**

**Deliver this draft treaty to the United Nations Committee on Peaceful Uses of Outer Space in their spring session in 2009, for further deliberation, debate, and (hopefully) adoption.**

**Organizing and conducting these international workshops will cost the ASE \$250K which we are in the process of raising. Of this we have ~\$180K, enough to cover the first year's cost.**



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**The End**

**Q&A**